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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The Aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

ED 059296

# TECHNICAL REPORT

# ON

# STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

# FOR

# DECORATOR, HAND 7-16.900

S-18
(Formerly D-226)

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# STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR DECORATOR, HAND 7-16.900

S-18

## Summary

The General Aptitude Test Battery, B-1001, was administered to seventy women employed as Hand Decorators at Red Wing Potteries, Incorporated, Red Wing, Minnesota. Supervisory ratings were used as the criterion. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes S-Spatial Aptitude, P-Form Perception, and A-Aiming were selected for inclusion in the test norms.

## GATB Norms for Decorator, Hand 7-16.900 - S-18

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Decorator, Hand 7-16.900

TABLE I

Minimum Acceptable Score on B-1001 and B-1002 for S-18

| B-1001 | | | B-1002 | | |
|---|---|---|---|---|---|
| Aptitude | Tests | Minimum Acceptable Aptitude Score | Aptitude | Tests | Minimum Acceptable Aptitude Score |
| S | CB-1-F<br>CB-1-H | 95 | S | Part 3 | 90 |
| P | CB-1-A<br>CB-1-L | 95 | P | Part 5<br>Part 7 | 95 |
| A | CB-1-C<br>CB-1-K | 95 | K | Part 8 | 95 |

## Effectiveness of Norms

The data in Table V indicate that 10 of the 16 poor workers, or 62 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 62 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 36 of the 42 workers who made qualifying test scores, or 86 percent, were good workers.

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TECHNICAL REPORT

## I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Decorator, Hand 7-16.900.

## II. Sample

The GATB, B-1001, was administered to a sample of 84 women employed as Hand Decorators at Red Wing Potteries, Incorporated, Red Wing, Minnesota. All of the workers in the Hand Decorator Department were tested. However, 14 women over 45 years of age were eliminated from the sample. Thus the final sample consisted of 70 women.

The employees were selected for employment on the basis of an interview which emphasized good health and eyesight as well as legible handwriting. The latter requirement was believed to be related to job success and the determination of legibility was made by the employment interviewer.

Table II shows the means, standard deviations, ranges, Pearson product-moment correlations (corrected for broad categories) with the criterion, and the standard errors of correlation for age and experience.

TABLE II

Means (M), Standard Deviations ($\sigma$), Ranges, Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{c}r$) and the Standard Errors of Correlation ($\sigma_{c}r$) for Age, and Experience

Decorator, Hand 7-16.900

N = 70

| | M | $\sigma$ | Range | $_{c}r$ | $\sigma_{cr}$ |
|---|---|---|---|---|---|
| Age (years) | 27.1 | 8.6 | 17 - 45 | .101 | .118 |
| Experience (months) | 27.5 | 22.8 | 1 - 101 | .397 | .101 |

The mean age of 27.1 years with a standard deviation of 8.6 and range from 17 to 45 seems to indicate that age is not operating as a selection factor. This is in agreement with the employer's statement that workers are hired between the ages of 18 to 50. In this sample, 60 percent were in the 17 to 24 year range. The median age for the high criterion group was 24 while the median age for the low criterion group was 20.5. Thus it appears that the workers in the low criterion group are slightly younger. However, age is not significantly correlated with the ratings obtained ($_{c}r$ = .101, $\sigma_{c}r$ = .118).

The employees rated high by the supervisors have a mean of 32 months of experience, which is approximately 5 months more than the mean for the total group and 18 months more than that for the low criterion group (M=14). The t-test of the differences in mean experience of the high and low group is

significant at the .001 level. The correlation between experience and the criterion of .397 with a standard error of .101 is significant at the .01 level. This may indicate a bias on the part of the supervisor in favor of those workers with the most experience.

There were no education data available for this sample.

III. Job Description

Job Title: Decorator, Hand 7-16.900

Job Summary: Paints stamped designs on unglazed pottery, using small hand brushes.

Work Performed

Works at a benoh designed to accommodate up to 120 production workers. Removes a piece of ware from the conveyor belt and paints designated portions of a design with a single color of pre-mixed paint, using hand brush. Returns work to conveyor for remaining steps of the painting process. Two colors may be used for small and simple portions of design. The worker must be able to determine quickly width and length of stroke to follow lines of marked design and to apply pressure and direction to hand brush.

IV. Experimental Battery

All of the tests of the GATB, B-1001, were administered to the sample group.

V. Criterion

The criterion consisted of supervisory ratings since production figures were not available for individual workers. Ratings were prepared by two supervisors, each having responsibility and knowledge of workers for 3 production lines. Since neither supervisor was acquainted with workers on all 6 production lines, one supervisor prepared ratings for workers on lines 2, 3, and 4 while the other supervisor rated workers on lines 5, 6, and 7. The ratings were prepared separately for each line according to whether the worker was "above average," "average," or "below average" and also by rank order on quality and quantity of job performance. Two independent ratings were prepared in the above manner approximately one month apart. Rank difference correlations of the ratings ranged from .82 to .98 with a median reliability of .87. These reliability coefficients are shown in Table III.

TABLE III

Reliability Coefficients of Ratings and Reratings Made
One Month Later Computed by Rank Difference Method of Correlations

| Line | Reliability Coefficient |
|---|---|
| 2 | .982 |
| 3 | .891 |
| 4 | .923 |
| 5 | .819 |
| 6 | .819 |
| 7 | .836 |

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For purpose of the study, 54 workers who were rated average or above on the second rating were considered to be the high or H group, whereas the remaining 16 workers were placed in the low or L group. All statistics were based on this division except the Pearson product-moment correlations corrected for broad categories ($_{c}r$). In this instance, ratings one and two were used and five categories resulted: HH, HL, LH, ML and LL. The $_{c}r$ was used along with the $r_{bis}$ in order to get all possible meaningful relationships between GATB aptitudes and the criterion.

As indicated in the discussion under sample, age does not appear to be significantly correlated with the criterion. On the other hand, there does appear to be a relationship between length of time on the job and success on the job as evidenced by the $_{c}r$ of .397 which is significant at the .01 level (See Table II). It is desirable to apply statistical correction to the criterion data to nullify the influence of experience, but this type of statistical treatment is not applicable to the supervisory ratings obtained for this study. Since the influence of experience on the criterion usually tends to lower correlations between test results and the criterion, it can be assumed that the validity coefficients are at least as high as those obtained.

## VI. Statistical and Qualitative Analysis

Table IV shows the means, standard deviations, Pearson product-moment correlations (corrected for broad categories) with the criterion, standard errors of product-moment correlation, biserial correlations with the criterion and the standard errors of biserial correlation for the aptitudes of the GATB.

The means and standard deviations of the aptitudes are comparable to general population norms with a mean of 100 and a standard deviation of 20.

TABLE IV

Means (M), Standard Deviations ($\sigma$), Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{c}r$), Standard Errors of Product-Moment Correlation ($\sigma_{c}r$), Biserial Correlations with the Criterion ($r_{bis}$), and the Standard Errors of Biserial Correlation ($\sigma_{r_{bis}}$) for the Aptitudes of the GATB

Decorator, Hand 7-16.900
N = 70

| Aptitudes | M | $\sigma$ | $_{c}r$ | $\sigma_{c}r$ | $r_{bis}$ | $\sigma_{r_{bis}}$ |
|---|---|---|---|---|---|---|
| G-Intelligence | 101 | 14 | .144 | .118 | .120 | .164 |
| V-Verbal Aptitude | 95 | 14 | .163 | .117 | .121 | .164 |
| N-Numerical Aptitude | 99 | 16 | -.011 | .120 | .017 | .166 |
| S-Spatial Aptitude | 106 | 14 | .248 | .113 | .255 | .158 |
| P-Form Perception | 115 | 16 | .149 | .118 | .253 | .158 |
| Q-Clerical Perception | 103 | 17 | .076 | .120 | .061 | .165 |
| A-Aiming | 106 | 18 | .277 | .111 | .363 | .150 |
| T-Motor Speed | 102 | 19 | .172 | .117 | .407 | .146 |
| F-Finger Dexterity | 98 | 17 | -.042 | .120 | .139 | .164 |
| M-Manual Dexterity | 98 | 20 | -.074 | .120 | .000 | .166 |

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The statistical results were interpreted in the light of the job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appeared to be important for this occupation:

Form Perception (P) - required to determine visually length and width of lines to be painted.

Aiming (A) and Finger Dexterity (F) - required to apply pressure and direction to the brush in painting precisely within fine guide lines.

The highest mean scores were obtained for Aptitudes S, P and A. Aptitudes S and A showed Pearson product-moment correlations with the criterion that were greater than twice their standard errors. Aptitudes A and T showed biserial correlations with the criterion that were greater than twice their standard errors.

Aptitude S was included in the final battery on the basis of its relatively high mean score and correlation with the criterion ($_{c}r$); Aptitude P was included on the basis of job analysis data and its high mean score. Aptitude A was included on the basis of job analysis data, mean score and correlations ($_{c}r$ and $r_{bis}$) with the criterion.

Aptitudes T and F were not included in the final battery. Although Aptitude T was significantly correlated with the criterion ($r_{bis}$) and Aptitude F was indicated by the job analysis data, these aptitudes did not have high means and did not materially increase the selective efficiency obtained by the aptitude pattern SPA.

The cutting score for Aptitude S was set at one standard deviation unit below the mean and rounded to the higher adjacent five point score level. For Aptitude P the cutting score was set at one sigma below the mean and rounded to the lower adjacent five-point score level, and on Aptitude A the cutting score was set at one sigma below the mean and rounded to the next higher five-point score level. Setting cutting scores at these levels yielded norms with the best selective efficiency and resulted in a cutting score of 95 on Aptitudes S, P, and A.

## VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized by placing those workers who were rated average or above into the high criterion group. Those workers who received ratings of below average were placed in the low criterion group.

Table V shows the relationship between test norms consisting of Aptitudes S, P and A each with a critical score of 95 and the criterion for Decorator, Hand 7-16.900. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

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TABLE V

Relationship between Test Norms Consisting of Aptitudes S, P, and A with Critical Scores of 95, 95, and 95, Respectively and the Criterion for Decorator, Hand 7-16.900

N = 70

| | Non-Qualifying Test Scores | Qualifying Test Scores | Total |
|---|---|---|---|
| Good Workers | 18 | 36 | 54 |
| Poor Workers | 10 | 6 | 16 |
| Total | 28 | 42 | 70 |

$r_{tet}$ = .44 $X^2$ = 3.244

$\sigma_{r_{tet}}$ = .21 P/2 $<$ .05

The data in the above table indicate a significant relationship between the test norms and the criterion for this sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data and their combined predictive efficiency, Aptitudes S, P and A each with a minimum score of 95 are recommended as B-1001 norms for the occupation of Decorator, Hand 7-16.900. The equivalent B-1002 norms consist of S-90, P-95 and K-95.